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the Food Safety Consortium newsletter

University of Arkansas Division of Agriculture, Iowa State University and Kansas State University

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Natural Extracts Can Cut Chemical Additives in Food Processing

Extracts from natural sources such as green tea, grape seed and bacteriocins such as nisin could be alternatives for food processors instead of chemicals as a means of protecting against pathogen contamination. Researchers for the Food Safety Consortium at the University of Arkansas Division of Agriculture have applied the natural extracts to chicken and turkey hot dogs with encouraging results.

“Food preservation systems often use chemicals and heat treatments to reduce the risk of bacterial food poisoning outbreaks and food spoilage,” explained Navam Hettiarachchy, a UA food science professor who led the research project. But consumers prefer minimal



Navam Hettiarachchy

processing and natural tasting foods without additives. Natural extracts can accomplish the same goal without compromising taste or food safety.

“There has been increasing evidence on the antimicrobial activities of the extracts from culinary ingredients such as green tea, grape seed and spices against foodborne pathogens,” Hettiarachchy said.

The studies showed that the natural plant extracts inhibited the growth of *Listeria monocytogenes* on the hot dogs when combined with reduced levels of chemical preservatives. The experiment used a combination of 75 percent chemical antimicrobials and 25 percent natural plant extracts. The chemical preservatives can be partially or wholly

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Fung's Double Tube Leads Way to Quicker Pathogen Detection

When government and industry were looking for a way to identify more rapidly the presence of the pathogenic *Clostridium perfringens* bacterium in food and water, Daniel Fung of Kansas State University realized he had a potential solution on his shelf. He applied what's known as the Fung Double Tube method that he developed decades earlier and determined that the detection time can be reduced from about a day or two down to four hours.



Daniel Fung demonstrates how food scientists can still use the Double Tube Method that he invented decades ago.

More work needs to be done to improve the process, but a successful effort would benefit food processors.

“In the meat industry and related food industries, the faster one can detect and enumerate live major pathogens such as *C. perfringens*, the faster corrective actions can be implemented or the food can be destroyed before reaching the consumers,” said Fung, a food science professor who researched the issue as a Food Safety

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Natural Extracts... (Continued from page 1)

replaced by natural plant extracts when the extracts are combined with other technologies such as heat treatment, electrostatic spraying or nanotechnology.

Among those other technologies to supplement the natural extracts, nanotechnology would likely be more effective than heat.

Consumers prefer minimal processing and natural tasting foods without additives.

"If we can deliver these antimicrobials in nanoparticles, we will have better pathogen inhibition at a much lower concentration of the antimicrobial, over a longer period of time," Hettiarachchy

said. "We have shown that in produce. We have conclusively demonstrated that if you

encapsulate the extracts in nanoparticles you have a better pathogen reduction in the meat system."

"The food processing companies are interested in the state-of-the-art delivery system with the natural antimicrobial extract for better pathogen control," she added. "Industry takes time to decide." ■

Fung's Double Tube... (Continued from page 1)

Consortium-supported project. "The benefit of a rapid method to detect and enumerate live *C. perfringens* in foods in four hours is obvious."

C. perfringens can cause poisoning through temperature abuse of prepared foods, usually meats and meat products. The Food and Drug Administration says small numbers of the organisms are often present after cooking and multiply to food poisoning levels during cool down and storage of prepared foods.

Rapid detection of the pathogen would benefit not only food processors but also agencies that keep water supplies safe. Fung explained that Hawaii officials look for *C. perfringens* as an indicator of the safety of recreational water.

"Hawaii is the only state that used *C. perfringens* as an indicator of fecal contamination in water," Fung said. "If there was too much *Clostridium perfringens*,

The faster one can detect and enumerate live major pathogens such as *C. perfringens*, the faster corrective actions can be implemented or the food can be destroyed before reaching the consumers.

they'd close the beach. They'd been using the system for many years in the lab, but their system took up to 48 hours to get a count."

That's longer than an agency would prefer when public health is at stake. Several years ago, Fung met a Honolulu water microbiologist at a conference when the subject came up. He explained the Fung Double Tube method for

detecting pathogens and showed the lab personnel in Hawaii how to apply it.

The Fung Double Tube method is relatively easy to implement. The system uses one large tube and one small tube. Insert the small tube into the larger tube that holds a water sample. Then add a specially melted agar — a gelatin-like product used for solidifying culture media as a thickening agent — to create a thin layer between the two tubes that will grow *C. perfringens*. The unit is then placed in an incubator at 42 degrees C.

"The system makes anaerobic microbiology very simple," Fung said. "One can see a *C. perfringens* colony in the Double tube in about four to five hours. We can know in five to six hours how many living colonies of *C. perfringens* per milliliter of water there are. That is a major improvement, and it's so cheap."

The system works well for water testing, but more research is necessary to prepare it for use in the food industry. Fung's research team is examining how to apply it for use with ground beef so the meat won't have to be incubated overnight before pathogen counts can be obtained.

"Then if you have a high number of perfringens, the food should be red flagged," Fung said. "When we finish our comparisons, then we can tell the food industry that if you have the double tube and in four to five hours you see a black colony with fluorescence, then you can count that as perfringens." ■

Vinegar, Natural Source of Nitrate Provide Way to Safeguard Organic Pork

Consumers' enthusiasm for natural and organic food products extends to cured pork products such as hams, bacon and frankfurters. But products can't be labeled as natural or organic if they contain preservatives. That means two traditional curing agents for pork — nitrite and nitrate — aren't allowed in natural and organic versions.

To work around that problem, Iowa State University researcher Joe Sebranek explained, industry found that vegetable juice powder could provide a natural source of nitrate to serve as a curing agent and still be classified as a natural source. But there still wouldn't be as much nitrite in the product as in a conventionally cured product, and it would be at greater risk from bacterial pathogens.

Sebranek, a distinguished professor of animal science, food science and human nutrition, researched the problem with support from the Food Safety Consortium and found a solution. Take a couple of natural antimicrobial ingredients — vinegar with lactate and vinegar with lemon powder — and incorporate them into the naturally cured pork products.

The result was that bacterial pathogens such as *Listeria monocytogenes* in the naturally cured pork products were inhibited, though still not to an equivalent level as in conventionally cured pork products.

"With natural and organic products you're limited to ingredients that qualify as natural or organic, respectively," Sebranek said. "If you use something that



Joe Sebranek

is traditionally used as a preservative, that's not permitted in a natural product. With a naturally fermented vinegar product, you have a mixture of organic acids. It's not typically used as a preservative but it provides some of the organic acids, that are recognized antimicrobials. There's a mixture in that kind of a product that essentially provides a preservative effect."

ISU researchers plan to examine other natural antimicrobial ingredients to see what would also be effective. Sebranek said there had already been some interesting results with cranberry extracts.

"Cranberry has a number of antioxidants and potential antimicrobial compounds," he said. "We're trying to get that more specifically identified. There are

"There's a mixture in that kind of a product that essentially provides a preservative effect."

a number of different kinds of extracts and compounds that are natural, which is the first thing that's necessary. Maybe you could combine enough antimicrobials to get you back to the same level of protection against pathogens as with the conventionally cured product. That would be our ultimate goal."

There would be potential practical application at the industrial level if the research leads to something that's economical. "And things like cranberry are an attractive kind of label addition too," Sebranek said. ■

Sebranek Named to ISU Endowed Faculty Position in Meat Science

Joseph G. Sebranek, distinguished professor of animal science, food science and human nutrition at Iowa State University, has been named the first holder of the Morrison Chair in Meat Science. The College of Agriculture and Life Sciences' meat science program in the department of animal science has been ranked number one in the nation by *Meat and Poultry* magazine.

A faculty member at Iowa State since 1975, Sebranek investigates the scientific principles important to development of new products and processes for the meat industry that will improve marketability of livestock. He also evaluates new technology proposed for the food industry to achieve the best adaptation for utilization and improvement of the safety of animal products as human food.

Sebranek was named a Charles F. Curtiss Distinguished Professor in Agriculture and Life Sciences at Iowa State in 2008. He is a fellow of the American Society of Animal Science and the Institute of Food Technologists. He has received numerous awards for his research, teaching and service at Iowa State. He holds a master's degree and a Ph.D. from the University of Wisconsin-Madison and a bachelor's degree from the University of Wisconsin-Platteville.

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Sebranek Named...*(Continued from page 3)*

The endowed faculty position was established by David and Judith Morrison of Paradise Valley, Ariz. David Morrison was CEO of Sampco, Inc., a food and beverage company based in Chicago, and he remains a consultant for that firm. He earned a bachelor's degree in 1969 in food technology and a master's degree in 1971 in chemical engineering. Judith earned a bachelor's degree in 1969 in home economics and a master's degree in 1976 in home economics education.

The Morrison Chair in Meat Science will have additional funds to support research, teaching, graduate assistant or postdoctoral stipends, technical assistance and other resources to advance work in food safety.

"Iowa State's meat science program is unmatched in the nation. Thanks to David and Judith Morrison, we will have the resources available that will help keep us at the top," said Wendy Wintersteen, endowed dean of the College of Agriculture and Life Sciences. "This will allow Dr. Sebranek to advance teaching and research efforts that will continue Iowa State's long legacy of finding science-based solutions that ensure the safety and security of the nation's meat industry. Many of our alumni are top leaders in the meat and poultry industry, and this new commitment will help us continue to prepare future managers, researchers and executives."

The gift is part of *Campaign Iowa State: With Pride and Purpose*, the university's \$800 million fundraising effort.

AAFP Conference Wraps Up Successful Year

Moving into its second year since being chartered, the Arkansas Association for Food Protection hosted nearly 100 people at its annual educational conference Sept. 28-29 at Tyson Foods in Springdale. A strong lineup of speakers from academic institutions, industry and government focused on the theme of "Enhancing Food Protection From Farm to Fork."

Frank Yiannas, Walmart Stores vice president for food safety, told the group during his presentation that he has spoken to numerous affiliates of the International Association for Food Protection and that the Arkansas affiliate's annual conference puts it among the nation's best for achieving so much so soon.

The conference opened both days with a greeting by a University of Arkansas administrator. On the first day, Milo Shult, the UA vice president for agriculture who will retire later this year, explained the Division of Agriculture's research role and its impact on industry and the state's economy. Michael Vayda, the new dean of the UA Dale Bumpers College of Agricultural, Food and Life Sciences, opened the second day's proceedings by telling the AAFP that the college wants "to produce the talent you need to contribute to the economy and vitality of the state of Arkansas."

Faculty presenters from each of the three institutions of the Food Safety Consortium — Steven Ricke of the U of A, Jim Dickson of Iowa State University and Kelly Getty of Kansas State University — each described an area of research at their respective university.

The agenda also included an informal dinner at the AQ Chicken House in Springdale.

The conference ended with Michael Sostrin of Walmart Stores, AAFP's 2009-10 president, passing the leadership to Ricke, who will serve as the 2010-11 president. The chapter presented a certificate to Sostrin in recognition of his service as AAFP's first president.

Officers were installed as follows for the 2010-11 year: Steven Ricke, UA Center for Food Safety, president; Mike Sostrin, Walmart Stores, past president; Hillary Hagan, Tyson Foods, president-elect; Jerri Lynn Pickett, Tyson Foods, vice president; David Edmark, UA Food Safety Consortium, communications director; Jennifer Ford, Tyson Foods, treasurer; Natalie Dyenson, Walmart Stores, director; Peggy Cook, Safe Foods Corp., director, and Sandra Lancaster, Arkansas Department of Health, director.



Steven Ricke (left), incoming president of the Arkansas Association for Food Protection, presents Michael Sostrin a certificate of appreciation for his service as the previous year's president.

Changes in Food Law, Science Face Industry

The food industry is facing potential new food safety laws and other factors that add up to the greatest overall changes since the approval of food legislation in the 1930s. The industry's environment includes a new focus on imported foods, consumers with no tolerance for unsafe food and new ways to harm a brand.

David Acheson, managing director for food and import safety at Salt Lake City-based Leavitt Partners, in July explained to an Institute of Food Technologists audience in Chicago that the impact of legislation pending in Congress would have new requirements for the industry to meet.

Acheson said Congress has historically been reactive and "poorly educated about food issues." Legislators have also "allowed food safety to become seriously underfunded."

Bills still awaiting final action in Congress contain numerous changes from current practice. Acheson listed provisions including the requirements for food safety plans, traceability and hazard evaluations, new regulations on produce, more federal inspections, more stringent importer requirements, mandatory recall authority and greater civil and criminal penalties for violations.

Interest in food safety has risen in recent years partly because of outbreaks of foodborne illness. Since 2006, Acheson said, 10 new food vehicles have emerged that have been linked to outbreaks, including bagged spinach, carrot juice, peanut butter and raw cookie dough.

Meanwhile, consumers have developed zero tolerance for unsafe food and can be heavily influenced by online reports. Social media reports can quickly condemn a product in the court of public opinion, Acheson explained. "Blogs can do you in whether you're right or wrong," he said.

The science of food is also changing, Acheson said. The use of genetic fingerprinting has expanded with faster and more accurate epidemiology. He cautioned

that the lowering of risk does not mean there is no risk.

Regulators have become proactive in enforcement and recalls. Acheson said an aggressive timeline is in place to write and implement new government regulations and that the FDA is increasing its focus on imported foods, with greater emphasis on environmental testing and controls.

For its part, industry must be prepared to protect its brand through realizing the importance of a solid food safety culture. Warning to beware of "blindness in the supply chain," Acheson said it's no longer enough for a company simply to do its own tasks well. "If somebody three steps up from you in the supply chain screws up, it's your brand that tanks."

Papers & Presentations

Navam Hettiarachchy, Arkansas, presented two modules in July for the Japan Asia Productivity Organization. They were "Managing Product Quality and Food Safety" and "Product Development and Value Addition" in the training course for women on the management of micro- and small-scale agro-food processing enterprises held in Kuala Lumpur, Malaysia.

Hettiarachchy was also quoted as a source in the article "Pathogen Protection" published in the Fall 2010 edition of *Research Frontiers*, a University of Arkansas magazine. She was also a source quoted in the article "Protein Film Protects Against Food Pathogens," also published in the Fall 2010 edition of *Research Frontiers*.

Hettiarachchy was also published as a co-author of "Infusion of Plant Extracts During Processing to Preserve Quality Attributes of Irradiated Chicken Breasts Over 9 months storage at -20 °C" in the *Journal of Food Processing and Preservation*, 34:287-307, and of "Antilisterial Activity and Consumer Acceptance of Grape Seed and Green Tea Extracts and Tartaric Acid Vacuum-Infused into Chicken Breast Meat" in the *Journal of Food Science* August online edition.

Daniel Fung, Kansas State, was a delegate to the International Academy

of Food Science and Technology and the International Association of Food Science and Technology World Congress in August in Cape Town, South Africa. At the K-State Food Science Institute, he presented "Thirty Years of International Developments in Rapid Methods and Automation in Microbiology: Systems, Trends, Market Value and Fung's Prediction to the Future."

In June, Fung served as director of the 30th annual International Workshop on Rapid Methods and Automation in Microbiology at K-State. He is founder of the workshop, which has attracted 4,000 participants from 60 countries since 1981.

In July, Fung attended the Institute of Food Technologists annual meeting in Chicago, where he served as a judge in Undergraduate Student Research Paper Competition, served as a critic at the Developing Scientists Oral Presentations and served as an executive committee member of the national Phi Tau Sigma honorary society. During the IFT meeting he also served as a resource person as past president of the Chinese American Food Society.

Fung also recently published the chapter "Microbial Hazards in Foods: Foodborne Infections and Intoxications"

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Food Safety Digest

by Dave Edmark

Anyone who has followed food safety news for the past decade has probably encountered these figures at least once in news articles, reports and speeches: 76 million illnesses, 325,000 hospitalizations and 5,000 deaths annually. Those statistics represent an estimate from the federal Centers for Disease Control of the impact of foodborne illness.

The problem is that those figures were compiled in 1999 for a report titled *Food-Related Illness and Death in the United States* and have been used widely ever since.

The CDC has been working since 2007 on updating its estimates. The American Meat Institute Foundation wants to see something new soon.

Betsy Booren, the AMIF director of scientific affairs, said in a letter to the CDC that it supports the update of the report “and encourages the expedited publication of the new estimation model for the burden of foodborne disease.” She said updated foodborne illness estimates could show tangible results to industry efforts to reduce pathogen risk in meat products.

Booren noted that the 1999 estimates were derived using adjustments for under-reporting of foodborne illnesses and that those adjustments are likely no longer valid because of changes in public health reporting in the past 20 years. She also said the 11-year-old estimates also “virtually ignore the newer, more accurate and specific methods of detecting microorganisms” and the food industry’s progress in improving the safety of its products.

Elisabeth Hagen took office recently as undersecretary for food safety at the U.S. Department of Agriculture and soon met with the National Association of Meat Processors to discuss priorities. Phil Kimball, NAMP executive director, said Hagen listed those priorities as communicating with stakeholders, working with federal inspectors to protect public health, work-

ing with other agencies and stakeholders to develop ideas on how to move forward on pre-harvest food safety and reviewing regulations and legislation that have an impact on the USDA Food Safety and Inspection Service.

Hagen told NAMP officials that she supported recent moves by FSIS to solicit input from stakeholders on policy issues early in the agency’s decision-making process.

■ ■ ■

There are mixed results in the latest survey of consumers’ food safety behavior. The telephone survey of 1,000 consumers in July showed that they’re doing some things right — such as the 78 percent who knew that defrosting meat and poultry in the refrigerator is the correct way — and other things wrong, as evidenced by only 20 percent using a meat thermometer to be sure food is properly cooked.

Those findings came from NSF International, an independent nonprofit organization that certifies products and writes standards for consumer goods. NSF also found that although 90 percent of respondents wash their hands after handling raw meat or poultry, 20 percent don’t use warm water and soap as determined to be the best way to reduce exposure to bacteria that causes foodborne illness. Also, only 31 percent were aware that it is safe to refreeze foods that were thawed in the refrigerator.

“These survey findings demonstrate the need for additional consumer education around food safety in the home,” said Cheryl Luptowski, NSF International’s home safety expert. “Many of the food safety practices we learn at home when we’re young are carried with us through life and passed to the next generation.”

■ ■ ■

China announced in September that it would invoke the death penalty for some cases of food safety offenses. The

Associated Press reported that China has used capital punishment previously in an outbreak of contaminated baby formula. The latest announcement came after more cases of tainted milk were reported.

A notice issued by the Public Security Bureau and three top law agencies said courts should order the highest penalties allowed in food safety cases. “Those deserving death penalties should be resolutely sentenced to death,” the notice said. ■

Paper & Presentations

(Continued from page 5)

in *Handbook of Meat Processing* published by Wiley Blackwell and the chapter “Rapid Methods and Automation in Microbial Food Safety” in *Perspectives on Food Safety Issues of Animal-Derived Foods* published by the University of Arkansas Press.

Catherine Strohbehn, Iowa State, delivered presentations in September on the SafeFood 101 curriculum at the ISU Alumni Organization and at a campus risk management students’ organization. She also spoke on “Implications of Local Foods Movement for Dietitians” at a food service management class. She presented a ServSafe training workshop for the School Food Service Summer Short Course in Waukee, Iowa, and an on-farm food safety workshop in Decorah, Iowa. She was also interviewed by KCCI-TV in Des Moines, WHO Radio in Des Moines, the *Ames Tribune* and Time.com as a source of information about the recent Iowa egg recall. ■